
FULL CONTENTS

[Claim(s)]
[Claim 1] The super-thin line which makes Ag concentration 0.05 - 2.0wt%, and is characterized by the remainder consisting of copper alloy wire material which is Cu.
[Claim 2] The manufacture method of the super-thin line which makes Ag concentration 0.05 - 2.0wt%, the rate of wire drawing performs 50% or more of wire drawing to the copper alloy wire material whose remainder is Cu, applies an insulating material under 200-400-degree C heating after an appropriate time at this ****(ed) copper alloy wire material, and is characterized by printing.

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the super-thin line used as magnet wires, such as an electric device, etc., and its manufacture method.
[0002]
[Description of the Prior Art] As for the magnet wire (winding) used for this, in connection with the miniaturization of an electric device, and the weight saving, narrow diameter-ization is demanded increasingly in recent years. However, the fracture tension of a wire rod becomes small, so that the cross section of a wire rod becomes small. For this reason, if the super-thin line used as a magnet wire, especially a diameter (phi) are one of things of 0.1mm or less, it is required that it should have high tensile strength.
[0003] Usually, as a magnet wire of a narrow diameter, after carrying out wire drawing of the copper wire to predetermined size, the synthetic enameled wire which made various insulating materials

apply, bake and cover with high temperature is used.

[0004] On the other hand, (other metal wires are the same) and by carrying out wire drawing, copper wire is work hardened and comes to have high tensile strength. In using copper wire as conductors, such as an electric wire, he is trying to obtain required tensile strength using the characteristics by this wire drawing in many cases.

[0005]

[Problem(s) to be Solved by the Invention] However, the copper wire work hardened has the characteristics which a metal texture recrystallizes and are softened also under the temperature between about 200-300 degrees C.

[0006] for this reason -- using copper wire as a magnet wire as mentioned above -- up to predetermined size -- wire drawing -- also carrying out -- Then, when an insulating material was applied and printed at high temperature and it was considered as synthetic enameled wire etc., spreading of an insulating material and baking needed to be performed at high temperature of 200 degrees C or more, copper wire became soft by high temperature processing at the time of this insulating material spreading, and there was usually a problem that tensile strength will fall.

[0007] this invention was made in view of such a conventional problem, and performs various examination about the alloy composition and its manufacture method of a wire rod -- a conductor -- the tensile strength of a part -- 35 kgf(s)/mm2 the super-thin line and its manufacture methods for [which has the above high intensity] magnet wires -- it is going to provide -- it is a thing.

[0008]

[Means for Solving the Problem] This invention according to claim 1 makes Ag concentration 0.05 - 2.0wt%, and the remainder is on the super-thin line which consists of copper alloy wire material which is Cu.

[0009] This invention according to claim 2 makes Ag concentration 0.05 - 2.0wt%, the rate of wire drawing performs 50% or more of wire drawing to the copper alloy wire material which is Cu, and the remainder is in the manufacture method of the super-thin line which applies and prints an insulating material on this ****(ed) copper alloy wire material under 200-400-degree C heating after an appropriate time.

[0010]

[Embodiment of the Invention] By the super-thin line of this invention, in order to prevent softening of the wire rod at the time of high temperature processing at the time of applying and printing an insulating material under high temperature of 200 degrees C or more, Ag is added in copper (Cu), it is considered as copper alloy wire material, and the Ag concentration is made into 0.05 - 2.0wt%. In addition, in this copper alloy wire material, a little impurities (for example, Si, P, Fe, etc.) which cannot usually be removed in process besides Ag are contained as unescapable impurities.

[0011] [here / having made Ag concentration into 0.05 - 2.0wt%] Although a heat-resisting property improves and tensile strength is improved by addition of Ag, [less than / 0.05wt%] 35 kgf(s)/mm2 It is because the above high tensile strength was not obtained, and is because the problem of being easy to disconnect when drawability gets worse and it **** on a super-thin line will come to arise if

2.0wt% is exceeded.

[0012] Furthermore, when applying and printing insulating materials, such as synthetic enamel, using the copper alloy wire material of such Ag concentration and manufacturing super-thin lines, such as a magnet wire, the rate of wire drawing performs 50% or more of wire drawing to this copper alloy wire material.

[0013] This wire drawing is performed using a cooling means as occasion demands between what is called the colds about normal temperature (25 degrees C), and it is made for that rate of wire drawing to become 50% or more moreover. Here, 50% or more says the thing of the working ratio by which the reduction of area of the wire rod end-face product in front of **** is made 50% or less by the elongation after **** in the rate of wire drawing. At less than 50%, having made this rate of wire drawing into 50% or more has the small improvement in the tensile strength by work hardening, and since it is inadequate, by making this value into 50% or more, it is the stage of wire drawing and aims at improvement in predetermined tensile strength first.

[0014] Next, insulating materials, such as synthetic enamel, are applied and printed on this ****(ed) copper alloy wire material under 200-400-degree C heating. the conductor made into the purpose by this -- the tensile strength of a part -- 35 kgf(s)/mm2 The super-thin line which has the above high intensity is obtained. here -- a conductor -- the tensile strength of a part means the tensile strength of the copper alloy wire material portion in the state where pre-insulation layer portions, such as synthetic enamel, were exfoliated.

[0015] Cooking temperature was made into the range of 200-400 degrees C by this spreading and a baking process because cooking temperature of temperature was too low at less than 200 degrees C and it became difficult to secure uniform spreading on the wire rod surface of an insulating material. Moreover, conversely, exceeding 400 degrees C, when temperature is too high, the copper alloy wire material itself softens, tensile strength falls, and it is 35 kgf/mm2. It is because the above high tensile strength is no longer obtained.

[0016] As shown in work-example point ** and Tables 1-2, two or more rough length copper alloy wire material (work examples 1-5, comparative examples 1-5) with a diameter of 8mm from which Ag concentration differs, respectively was manufactured with continuous casting equipment, and, finally it ****(ed) to 0.02mm in diameter. In the intermediate **** stage, two or more times of intermediate annealing was performed at the temperature of 300-400 degrees C in the meantime.

[0017] And the rate of wire drawing as shown in Tables 1-2 is followed after the last intermediate annealing. Performed the last wire drawing (wire drawing from 0.05mm in diameter to 0.02mm in diameter), next it was made to run each above-mentioned copper alloy wire material by linear velocity 150 m/min, the insulating material of synthetic enamel (varnish etc.) was applied and baked under cooking temperature as shown in Tables 1-2, and each super-thin line was obtained.

[0018] each of these super-thin lines -- a conductor -- the tensile strength and drawability of the part were measured and the result was written together to Tables 1-2. Here, tensile strength set to the tension tester the copper alloy wire material portion in the state where the pre-insulation layer portion was exfoliated, and was performed. About drawability, the continuation strip wiring roll performed ****

from 0.05mm in diameter to 0.02mm in diameter, the number of times of disconnection per 10kg in that case considered 10 or less times of things as success (O), and the thing exceeding 10 times was evaluated as rejection (x).

[0019]

[Table 1]

	実施例				
No.	1	2	3	4	5
Ag濃度 (wt%)	0.56	0.075	1.8	0.075	0.075
伸線加工率 (%)	99	99	99	99	56
塗布、焼付け温度 (℃)	250	250	250	380	380
引張強度 (Kgf/mm^2)	58	49	62	38	36
伸線性	○	○	○	○	○

[0020]

[Table 2]

	比較例				
No.	1	2	3	4	5
Ag濃度 (wt%)	0.03	2.2	0.56	0.56	0.0008
伸線加工率 (%)	99	99	99	47	99
塗布、焼付け温度 (℃)	250	250	450	250	250
引張強度 (Kgf/mm^2)	29	64	33	33	27
伸線性	○	×	○	○	○

[0021] the case of the super-thin line (work examples 1-5) which starts this invention from the above-mentioned table 1 -- any -- a conductor -- the tensile strength of a part -- 35 kgf(s)/mm2 while high intensity is obtained above -- drawability -- any -- although -- it was success (O).

[0022] on the other hand -- the case of the comparative example 1 which is too lower than the conditions of this invention -- the conductor after printing -- the tensile strength of a part -- 29 kgf (s)/mm2 It was low. the case of the comparative example 2 which is too higher than the conditions of this invention -- the conductor after printing -- the tensile strength of a part -- 64 kgf(s)/mm2 although it is high -- drawability -- a rejection -- it was (x). the case of the comparative example 3 which is too higher than the conditions of this invention -- the conductor after printing -- the tensile strength of a

part -- 33 kgf(s)/mm2 It was low. the case of the comparative example 4 which is too smaller than the conditions of this invention -- the conductor after printing -- the tensile strength of a part -- 33 kgf (s)/mm2 It was low. Ag concentration (0.0008wt%) is too low -- the case of the comparative example 5 almost near pure copper -- the conductor after printing -- the tensile strength of a part -- 27 kgf (s)/mm2 It was low.

[0023]

[Effect of the Invention] according to the super-thin line concerning this invention, and its manufacture method, a diameter is what consists of very thin copper alloy wire material of 0.1mm or less, for example so that clearly from the above explanation -- and a conductor -- the tensile strength of a part -- 35 kgf(s)/mm2 The outstanding wire rod which has the above high tensile strength is obtained. If this is used as a magnet wire etc., the miniaturization of an electric device and a weight saving can be promoted sharply.

[Translation done.]